LOWER PASSAIC RIVER RESTORATION PROJECT OPERABLE UNIT (OU) 4

Remedial Investigation/Feasibility Study Oversight
Final Quality Assurance Project Plan (QAPP)
For Physical Water Column Monitoring

USACE Contract No. W912DQ-18-D-3008
Task Order No. F3009, ATP 01

August 13, 2019

Prepared for:
U.S. Army Corps of Engineers
Kansas City District

Prepared by:
CDM Federal Programs (CDM Smith)
110 Fieldcrest Avenue, #8
6th Floor
Edison, New Jersey 08837

TABLE OF CONTENTS

List of Appendices

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Acronyms

°C	degrees Celsius
µm	micrometer
%	percent
%R	percent recovery
ABS	absolute difference
AES	atomic emission spectrophotometry
ANSETS	Analytical Services Tracking System
ASC	analytical services coordinator
bgs	below ground surface
CCV	continuing calibration verification
CDM Smith	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIH	certified industrial hygienist
CLP	contract laboratory program
COC	chain of custody
CPG	Cooperating Parties Group
CRQL	contract required quantitation limit
CSM	conceptual site model
CWCM	chemical water column monitoring
DESA	Division of Environmental Science and Assessment
DOC	dissolved organic carbon
DQA	data quality assessment
DQO	data quality objective
DV	data validation
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ESAT	Environmental Services Assistance Team
FASTAC	Field and Analytical Services Teaming Advisory Committee
FCR	field change request
FID	flame ionization detector
FS	feasibility study
FTL	field team leader
HASP	health and safety plan
ID	identification
IR	infra-red
L	liter
LCS	laboratory control sample
MDL	method detection limit
mg/kg	milligram per kilogram
mg/L	milligram per liter
mL	milliliter
MPC	measurement performance criteria
MS	matrix spike
MSD	matrix spike duplicate
MSA	master services agreement
NA	not applicable

Acronyms (continued)

NELAP	National Environmental Laboratory Accreditation Program
NIST	National Institute of Standards and Technology
NJDEP	New Jersey Department of Environmental Protection
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PAL	project action limit
PCB	polychlorinated biphenyl
PCDD/PCDF	polychlorinated dibenzodioxins/furans
PE	professional engineer
PM	project manager
POC	particulate organic carbon
ppm	parts per million
PQLG	project quantitation limit goal
PWCM	physical water column monitoring
QA	quality assurance
QAS	quality assurance specialist
QAM	quality assurance manager
QAPP	quality assurance project plan
QC	quality control
QCS	quality control sample
QL	quantitation limit
QMP	quality management plan
QP	quality procedures
RAS	routine analytical services
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RPD	relative percent difference
RPM	remedial project manager
RSCC	regional sample control coordinator
SARA	Superfund Amendments and Reauthorization Act
SDG	sample delivery group
SMO	EPA sample management office
SOP	standard operating procedure
SOW	statement of work
SSC	suspended solids concentration
SSHO	site health and safety officer
SVOC	semi volatile organic compound
TAT	turnaround time
TBD	to be determined
TM	task manager
TOC	total organic carbon
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

Section 1 Introduction

CDM Federal Programs Corporation (CDM Smith) received task order No. F3009, ATP 01 from the U.S. Army Corps of Engineers, Northwestern Division (USACE) contract No. W912DQ-18-D-3008. CDM Smith has been tasked to support USACE and the U.S. Environmental Protection Agency (EPA) in providing oversight of the Remedial Investigation (RI)/Feasibility Study (FS) for the Lower Passaic River (LPR) Restoration Project, Operable Unit (OU) 4, New Jersey. This task order involves oversight of the Cooperating Parties Group (CPG) RI/FS field investigation that includes field and laboratory activities, including physical water column monitoring (PWCM).

This quality assurance project plan (QAPP) has been prepared in accordance with UFP-QAPP manual (EPA 2005) and optimized worksheets (EPA 2012) and is compliant with EPA's QAPP requirements document EPA QA/R-5 (EPA 2001). In addition, this project will be implemented in accordance with the quality procedures in CDM Smith's Quality Manual (2018). This QAPP is the governing document for execution of the oversight task. CDM Smith will use various plans prepared by the CPG contractors to verify proper execution of the RI/FS.

The QAPP covers oversight tasks currently assigned to CDM Smith during the CPG's PWCM. Oversight activities related to other components of the CPG's Current Conditions Monitoring Program will be described in future QAPP addenda. As the scope of work and CPG field activities become more defined, the appropriate addenda will be prepared to reflect future changes.

1.1 Site Overview

On May 8, 2007, EPA announced that it had reached agreement with 73 companies considered potentially responsible for contamination in the LPR to undertake a RI/FS pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendment and Reauthorization Act (SARA). These parties, referred to as the CPG, have retained the consultants de maximis, inc., Anchor QEA, AECOM, and Ocean Surveys, Inc. to support the CPG's RI/FS effort for the lower 17.4 miles of the Passaic River.

In 2014, the CPG and their contractors completed field investigation work required to support the 2007 agreement. In December 2017, the CPG approached EPA, requesting to perform a source control interim action on the upper 9 miles (encompassing river mile 8.3 to the Dundee Dam) of the LPR. Subsequently, in an October 10, 2018 letter, EPA directed the CPG to prepare a streamlined FS for OU4 of the Diamond Alkali Site. In support of this directive the CPG will be performing additional investigative work to establish current conditions of the upper 9 miles of the LPR OU4.

1.2 Site Background and Path Forward

More than 200 years of industrialization and urbanization have resulted in large impacts to the LPR watershed, which was an important location for industry during the American Industrial Revolution (Malcolm Pirnie 2007). Industrial operations included cotton mills, manufactured gas plants, paper manufacturers, chemical manufacturers, shoemakers, and recycling facilities (Malcolm Pirnie 2007).

These industries, as well as other industries developed during the late 19th and early 20th centuries, used the LPR for process water and waste disposal, which adversely affected water and sediment quality. As a result of these historical and existing factors, sediment and water quality in the LPR are still impaired today.

The CPG-led field investigation is intended to characterize the nature and extent of contamination in sediment and surface water, which may be used to support the selection of a remedy. The oversight program is designed to provide technical review and evaluation of CPG-implemented field sampling plans. This oversight QAPP is intended to integrate the technical and quality control (QC) aspects of the oversight program and to provide guidance on 2019 and 2020 field activities associated with a PWCM investigation of the LPR.

This oversight QAPP details the planning processes for conducting field oversight and collecting split samples and describes the implementation of quality assurance (QA) and QC activities developed for this oversight program. The objective of CDM Smith's split sample collection is to verify the accuracy of the CPG's data. When required, this QAPP will be amended as 2019 and 2020 field activities/schedule are further defined.

The oversight described in this QAPP is for PWCM. Oversight will include field observation of the deployment/retrieval of instrumentation, maintenance checks of instruments, and collection of physical data for use in characterizing LPR estuarine dynamics and movement of suspended sediments. Additional oversight activities will include a review of CPG-selected sampling locations (as necessary, oversight staff will communicate with EPA and USACE on sampling locations). As part of this oversight task, CDM Smith will accept surface water split samples for suspended solids concentration (SSC), dissolved organic carbon (DOC), and particulate organic carbon (POC) analysis.

Sampling beyond the PWCM will be elaborated on in the relevant QAPP addenda.

USACE Contract No. W912DQ-18-D-3008
Task Order No. F3009, ATP 01

For

LOWER PASSAIC RIVER RESTORATION PROJECT OPERABLE UNIT (OU) 4
Remedial Investigation/Feasibility Study Oversight
Final Quality Assurance Project Plan
For Physical Water Column Monitoring

Prepared for: U.S. Army Corps of Engineers

Prepared by*:* *Alex Warzinski*

Date: *August 13, 2019*

QAPP Worksheets #1 and 2: Title and Approval Page
(UFP-QAPP Manual Section 2.1)
(EPA 2106-G-05 Section 2.2.1)

Contract: USACE Contract No. W912DQ-18-D-3008
Task Order/Operable Unit: Task Order No. F3009, ATP 01 / OU4

CDM Smith Project Manager:
David Marabello Signature_____

CDM Smith QA Manager:
Jo Nell Mullins Signature Jennifer Oxford for_____

USACE Project Manager:
Elizabeth Franklin Signature_____

EPA Remedial Project Manager:
Diane Salkie Signature_____

EPA Quality Assurance Officer:
Bill Sy Signature_____

State Regulatory Agency /Stakeholders (name/title/signature/date) (as applicable):
EPA, USACE, New Jersey Department of Environmental Protection, New Jersey Department of Transportation, National Oceanic Atmospheric Administration, U.S. Fish and Wildlife Service

Dates and Titles of Plan and Reports Written for Previous Site Work, if Applicable:
Quality Assurance Project Plan Hydrographic Survey Addendum. December 2018.

Quality Assurance Project Plan, Addendum #13, Chemical Water Column Monitoring Study/Small Volume Collection Water Quality Monitoring for River Mile 10.9 Removal Action. August 2013.

Quality Assurance Project Plan, Addendum #12, Collection of Background Surface Sediment Samples. October 2012.

Quality Assurance Project Plan, Addendum #11, Chemical Water Column Monitoring Study/High Volume Chemical Data Collection Program. December 2012.

Revised Final Quality Assurance Project Plan, Addendum #10, Low Resolution Coring Supplemental Sampling Program. January 2012.

Final Quality Assurance Project Plan, Addendum #9, River Mile 10.9 Characterization Study. August 2011.

Revised Final Quality Assurance Project Plan, Addendum #8, Chemical Water Column Monitoring Study/Small Volume Chemical Data Collection. November 2011.

Final Quality Assurance Project Plan, Addendum #7, Caged Bivalve Survey. May 2011.

Quality Assurance Project Plan, Addendum #6, Habitat Identification Survey. July 2010.

Quality Assurance Project Plan, Final Addendum #5, Revision 1, Fish Tissue Analysis. August 2010.

Quality Assurance Project Plan, Final Addendum #4, Surface Sediment Samples Co-located with small Forage Fish Tissue Samples – Collected in Conjunction with Summer 2010 Benthic Community Survey. July 2010.

Quality Assurance Project Plan, Final Addendum #3, Spring and Summer 2010 Benthic Invertebrate Community Surveys. June 2010.

Final Quality Assurance Project Plan, Addendum #2, Late Spring/Early Summer 2010 Fish Community Survey. June 2010.

Quality Assurance Project Plan, Final Addendum #1, Avian Community Survey. July 2010.

Final Quality Assurance Project Plan for Physical Water Column Monitoring and Generic Information for Upcoming Tasks. March 2010.

Required QAPP elements and required information that are not applicable (NA) to the project, and an explanation for their exclusions:
This is an oversight project; therefore, the CPG's contractors will be collecting the samples, performing health and safety monitoring, and having responsibility for equipment calibration, inspection, and maintenance. CDM Smith will monitor field activities, receive split samples, and prepare split samples for shipment.

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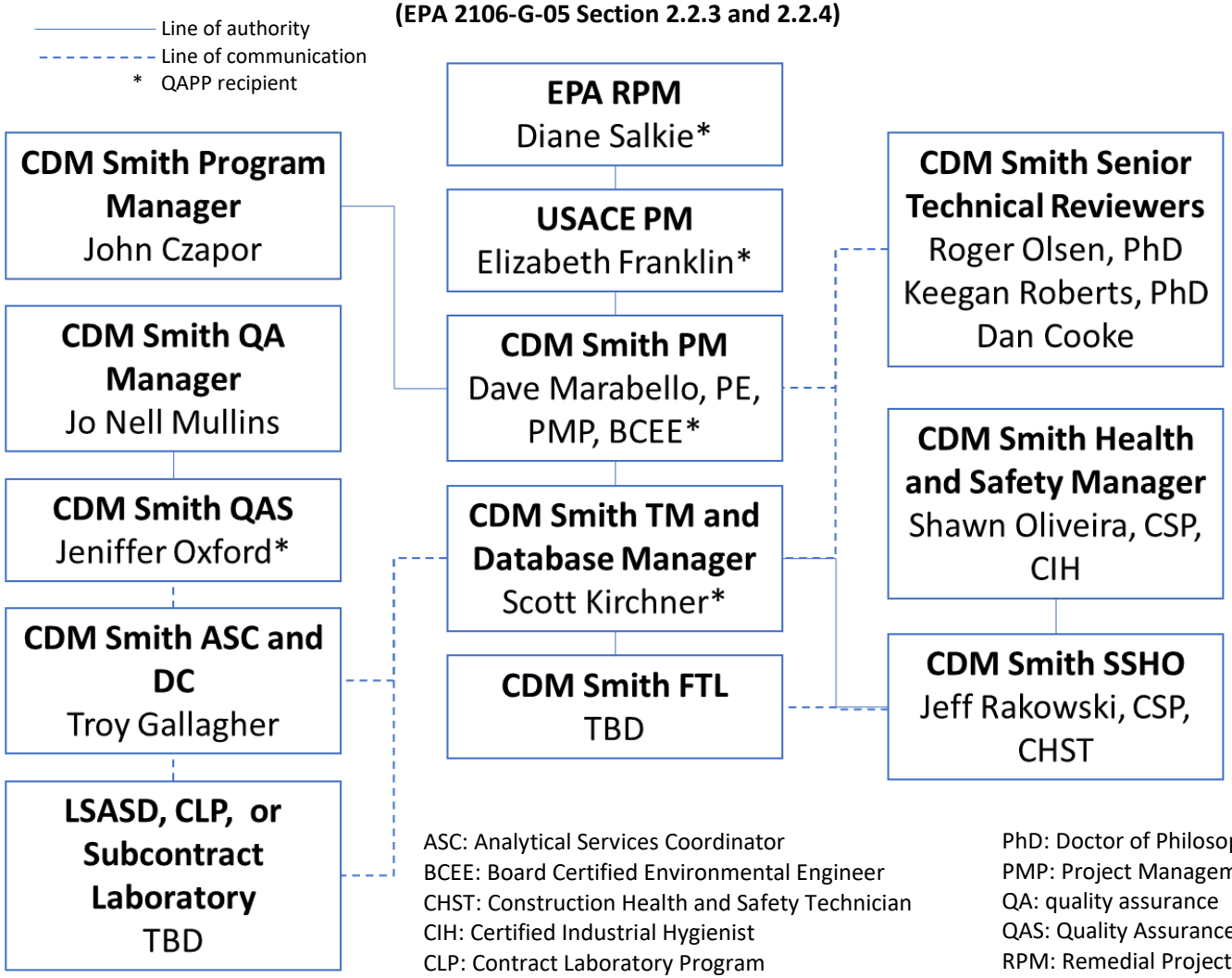
QAPP CROSSWALK
Identifying Information

Optimized UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
1 & 2	Title and Approval Page	2.2.1	Title, Version, and Approval/Sign-Off
3 & 5	Project Organization and QAPP Distribution	2.2.3	Distribution List
		2.2.4	Project Organization and Schedule
4, 7 & 8	Personnel Qualifications and Sign-off Sheet	2.2.1	Title, Version, and Approval/Sign-Off
		2.2.7	Special Training Requirements and Certification
6	Communication Pathways	2.2.4	Project Organization and Schedule
9	Project Planning Session Summary	2.2.5	Project Background, Overview, and Intended Use of Data
10	Conceptual Site Model	2.2.5	Project Background, Overview, and Intended Use of Data
11	Project/Data Quality Objectives	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
12	Measurement Performance Criteria	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
13	Secondary Data Uses and Limitations	Chapter 3	QAPP Elements for Evaluating Existing Data
14 & 16	Project Tasks & Schedule	2.2.4	Project Organization and Schedule
15	Project Action Limits and Laboratory-Specific Detection / Quantitation Limits	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
17	Sampling Design and Rationale	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
18	Sampling Locations and Methods	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
		2.3.2	Sampling Procedures and Requirements
19 & 30	Sample Containers, Preservation, and Hold Times	2.3.2	Sampling Procedures and Requirements
20	Field QC	2.3.5	Quality Control Requirements
21	Field SOPs	2.3.2	Sampling Procedures and Requirements
22	Field Equipment Calibration, Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
23	Analytical SOPs	2.3.4	Analytical Methods Requirements and Task Description
24	Analytical Instrument Calibration	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables

QAPP CROSSWALK
Identifying Information

Optimized UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
26 & 27	Sample Handling, Custody, and Disposal	2.3.3	Sample Handling, Custody Procedures, and Documentation
28	Analytical Quality Control and Corrective Action	2.3.5	Quality Control Requirements
29	Project Documents and Records	2.2.8	Documentation and Records Requirements
31, 32 & 33	Assessments and Corrective Action	2.4	Assessments and Data Review
		2.5.5	Reports to Management
34	Data Verification and Validation Inputs	2.5.1	Data Verification and Validation Targets and Methods
35	Data Verification Procedures	2.5.1	Data Verification and Validation Targets and Methods
36	Data Validation Procedures	2.5.1	Data Verification and Validation Targets and Methods
37	Data Usability Assessment	2.5.2	Quantitative and Qualitative Evaluations of Usability
		2.5.3	Potential Limitations on Data Interpretation
		2.5.4	Reconciliation with Project Requirements

QAPP Worksheet #3 & 5: Project Organization and QAPP Distribution
(UFP-QAPP Manual Section 2.3 and 2.4)
(EPA 2106-G-05 Section 2.2.3 and 2.2.4)



ASC: Analytical Services Coordinator
BCEE: Board Certified Environmental Engineer
CHST: Construction Health and Safety Technician
CIH: Certified Industrial Hygienist
CLP: Contract Laboratory Program
CSP: Certified Safety Professional
DC: Data Coordinator
FTL: Field Team Leader
LSASD: Laboratory Services and Applied Science Division
PE: Professional Engineer
PhD: Doctor of Philosophy
PMP: Project Management Professional
QA: quality assurance
QAS: Quality Assurance Specialist
RPM: Remedial Project Manager
PM: Project Manager
SSHO: Site Safety and Health Officer
TBD: to be determined
TM: Task Manager

QAPP Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

ORGANIZATION: CDM Smith

Name	Project Title/Role	Education /Experience	Specialized Training/Certifications	Signature/Date[1]
Shawn Oliveira	**Health and Safety Manager** – Oversees adherence to Health and Safety requirements	M.S. Environmental Engineering; B.S. Chemistry 21 years of experience	CSP, CIH	
Jeff Rakowski	**Site Safety and Health Officer (SSHO)** – Manages health and safety requirements at the site	B.S., Geography 13 years of experience	CSP, CHST	
Troy Gallagher	**Analytical Services Coordinator (ASC)** – Coordinates with EPA Regional Sample Control Coordinator (RSCC), Laboratory Services and Applied Science Division (LSASD) laboratory, and subcontract laboratories **Data Coordinator (DC) –** Facilitates field investigation data review and upload	B.S., Chemistry 4 years of experience		
Jo Nell Mullins	**Quality Assurance Manager (QAM)** – Develops and implements the CDM Smith QA program and assesses the implementation of the quality requirements for all projects	M.S., Environmental Health B.S., Biology/Chemistry 15 years of experience	American Society for Quality (ASQ) Certified Quality Auditor; ISO 14001 Lead Auditor Certified; Nuclear Quality Assurance-1 (NQA-1) Lead Auditor Certified	

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QAPP Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

ORGANIZATION: CDM Smith (continued)

Name	Project Title/Role	Education /Experience	Specialized Training/Certifications	Signature/Date[1]
Jeniffer Oxford	**QA Specialist** – Oversees adherence to QA requirements	B.S., Natural Sciences; 30 years of experience		
David Marabello	**PM** – Oversees project and responds to EPA RPM; manages subcontractors	M.S., Environmental Engineering; B.S., Chemical Engineering; 30 years of experience	PE, PMP, BCEE	
Scott Kirchner	**Task Manager** – Oversees the field oversight activities; provides guidance on the sampling and field program; analyzes the data; and has responsibility for implementing the field activities and other tasks as applicable to project	B.S., Chemistry; B.S., Environmental Science; 27 years of experience		
Scott Kirchner	**Database Manager** – Oversees data management; coordinates with validation staff	B.S., Chemistry; B.S., Environmental Science; 27 years of experience		
To be determined (TBD)	**FTL –** Oversees all field investigation activities		Trained in EPA sampling methods, and field testing procedures	

ORGANIZATION: EPA[2]

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date[1]
Diane Salkie	RPM	NA	NA	

QAPP Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

ORGANIZATION: USACE[2]

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date[1]
Elizabeth Franklin	PM	NA	NA	

ORGANIZATION: Laboratories

Name	Project Title/Role	Education/Experience	Specialized Training/ Certifications	Signature/Date[1]
EPA contract laboratory program (CLP) Laboratory[3] – TBD		TBD (Experience vetted by accreditation body)	National Environmental Laboratory Accreditation Program (NELAP)/EPA CLP	
[LSASD - Sumy Cherukara]	QA Officer	TBD (Experience vetted by accreditation body)	NELAP/Trained in EPA and standard analytical methods	
CDM Smith subcontract Laboratory – TBD	QA Officer	TBD (Experience vetted by accreditation body)	NELAP	

Notes:

1. Signatures indicate personnel have read and agree to implement this QAPP as written.
2. EPA Headquarters staff reviews and maintains the résumés of education and experience for key laboratory staff. This information is not available for the QAPP.
3. A CLP Laboratory is not used for PWCM but may be used in future QAPP addenda.

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathways, Documentation, etc.)
Regulatory agency interface	PM	Dave Marabello	(732) 590-4691	The CDM Smith PM will send all information about the project to the EPA RPM. Field changes will be discussed with the EPA RPM prior to implementation.
Manage Field Tasks	Task Manager (TM)	Scott Kirchner	(732) 590-4677	Act as liaison to PM concerning investigation activities. Daily communication with project team and PM. Communicate implementation issues to FTL.
QAPP Changes: In the field Prior to field work During project execution	FTL	TBD		Notify TM immediately and promptly complete a Field Change Notifications (FCN) form and/or corrected worksheets. Send FCR forms to the Quality Assurance Specialist (QAS).
	PM or TM	Dave Marabello or Scott Kirchner	(732) 590-4691 (732) 590-4677	Notify EPA RPM, PM, and ASC of delays or changes to field work. Prepare QAPP addendums or revisions in consultation with the client.
Field corrective actions	FTL	TBD		FTL will oversee implementation of corrective action and notify PM and TM by email. Task leader will complete the corrective action report form.
Field progress reports	FTL	TBD		Complete daily and submit to PM and TM. PM will forward to EPA RPM upon request.
Booking of Analytical Services	FTL	TBD		Submit request to ASC before the time frame below.
	ASC	Troy Gallagher	(212) 377-4514	LSASD analytical services through RSCC 6 weeks prior to sampling for special requests and 3 weeks for routine services.
Facilitate Database Setup and Data Management Planning	FTL	TBD		Provide sample and analytical information prior to sample collection. Provide information on sample and analytical reporting groups and types of report tables required for project.
Facilitate Data Management	CDM Smith DC	Troy Gallagher	(212) 377-4514	Notify laboratory via email of incomplete or errors in data package or electronic data deliverables (EDDs). Provide data, sample identification (ID), locations, and analyses. Transmit completed sample tracking information to data manager by the completion of each sampling case.

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathways, Documentation, etc.)
Incomplete EDDs or other EDD issues	CDM Smith Data Manager, TM, and Data Coordinator	Scott Kirchner	(732) 590-4677	Personnel will request resubmittal of corrected EDD by email.
Data verification issues, e.g., incomplete records	CDM Smith FTL and DC	TBD		DC will send an email to the FTL when an issue is found. FTL will address questions or any discrepancies.
Field Corrective Action	CDM Smith QAS, auditor, TM, FTL, and Field Team	Jeniffer Oxford	(212) 377-4536	PM, TM, and FTL will identify corrective actions. FTL initiates corrective action on identified field issues immediately or within QAM recommended time frame.
Procurement of analytical services	FTL/ASC	Troy Gallagher	(212) 377-4514	FTL or task leader will prepare laboratory request; ASC will review and send email to RSCC. If needed, the ASC will prepare an analytical statement of work (SOW) and submit for project chemist review. FTL initiates laboratory kick-off call with subcontract laboratory(-ies) and emails agenda.
Analytical Services Support	CDM Smith ASC	Troy Gallagher	(212) 377-4514	Act as liaison with RSCC for CLP laboratories (if used in QAPP addenda), with Ness Tirol for LSASD, and with subcontract laboratory(-ies).
Laboratory Quality Control Variances and Analytical Corrective Actions	Laboratory PM or QC Officer	TBD		Daily communication with the laboratory staff and regular communication with the CDM Smith ASC, QAC, or designee. Provide oversight and direction on technical issues as needed.
Notification of Analytical Issues Sample receipt variances	CDM Smith ASC	Troy Gallagher	(212) 377-4514	Notify FTL of any sample collection/shipment issues. Notify RSCC, LSASD laboratory, or subcontract laboratories to initiate corrective action.
Data validation issues, e.g., noncompliance with procedures; Data review corrective actions	CDM Smith data validator or data assessor	Scott Kirchner	(732) 590-4677	Submit a list of questions or issues to EPA or the subcontract laboratory as appropriate for correction or other appropriate response.

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathways, Documentation, etc.)
Reporting of Issues Relating to Analytical Data Quality (including ability to meet reporting limits and usability of data)	CDM Smith ASC	Troy Gallagher	(212) 377-4514	Communicate to PM and TM as appropriate.
	CDM Smith Data Assessor	Vanessa Macwan	(732) 225-7000	Communicate to PM and TM as appropriate. Document situation and effect in a data quality report prepared prior to preparing the oversight report.
Release of Analytical Data	CDM Smith ASC	Troy Gallagher	(212) 377-4514	Receive and review data packages before data is used. Initiate data validation (DV) of subcontract laboratory data.
Site Health and Safety Issues Stop Work due to Safety Issues	CDM Smith SHSO	Jeff Rakowski	(732) 590-4665	Make decisions regarding health and safety issues and upgrading personal protective equipment. Communicate to PM, TM, Health and Safety Manager, and field staff as appropriate.

QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

Projected Date(s) of Sampling: Summer/Fall 2019 **CDM Smith Site Manager:** Dave Marabello	**Site Name:** Diamond Alkali OU4 **Site Location:** LPRSA
Date of Planning Session: 4/11/19	
Scoping Session Purpose: CPG presented its proposal for the Current Conditions Monitoring to USEPA/Partner Agencies	

Name	Affiliation	E-mail Address
USEPA Team		
Michael Sivak	USEPA	Sivak.michael@epa.gov
Diane Salkie	USEPA	salkie.diane@epa.gov
Chuck Nace	USEPA	Nace.Charles@epa.gov
Beth Franklin	USACE	Elizabeth.A.Franklin@usace.army.mil
Andrew Bullard	CDM Smith	bullardak@cdmsmith.com
Jonathan Clough	Warren Pinnacle	jclough@warrenpinnacle.com
Dan Cooke	CDM Smith	cookedw@cdmsmith.com
Aaron Frantz	CDM Smith	FrantzAR@cdmsmith.com
Ed Garland	HDR/USEPA Consultant	edward.garland@hdrinc.com
John Kern	Kern Statistical Services	jkern@KernStat.com
Scott Kirchner	CDM Smith	kirchnersf@cdmsmith.com
Keegan Roberts	CDM Smith	robertsk@cdmsmith.com
James Wands	HDR	james.wands@hdrinc.com
New Jersey Department of Environmental Protection (NJDEP) Team		
Anne Hayton	NJDEP	Anne.hayton@dep.nj.gov
Jay Nickerson	NJDEP	jay.nickerson@dep.nj.gov
Myla Ramirez	NJDEP	Myla.Ramirez@dep.nj.gov
John Wolfe	LimnoTech	jwolfe@limno.com
CPG Team		
Robert Law	de maximis	rlaw@demaximis.com

QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

Name	Affiliation	E-mail Address
Bill Potter	de maximis	otto@demaximis.com
Gary Fisher	CPG	gary.fisher@nokia.com
Doug Reid-Green	CPG	douglas.reid-green@basf.com
Kristen Durocher	AECOM	Kristen.Durocher@aecom.com
Sue Harden	AECOM	susan.harden@aecom.com
John Connolly	Anchor QEA	jconnolly@anchorqea.com
Jim Rhea	Anchor QEA	jrhea@anchorqea.com
Mark LaRue	Anchor QEA	mlarue@anchorqea.com
Peter Israelsson	Anchor QEA	pisraelsson@anchorqea.com
Mike Johns	Windward Environmental	MikeJ@windwardenv.com
Lisa Saban	Windward Environmental	lisas@windwardenv.com

Comments/Decisions: The CPG presented its proposal for the Current Conditions Monitoring Program to EPA, NJDEP, and their consultants. EPA and NJDEP were generally in agreement on the PWCM scope, and discussions focused on the scope of the chemical monitoring of water, sediment, and biota. A follow-up meeting was scheduled for and held on April 17, 2019.

Projected Date(s) of Sampling: Summer/Fall 2019 **Project Manager:** Dave Marabello	**Site Name:** Diamond Alkali OU4 **Site Location:** LPRSA
Date of Planning Session: 4/17/2019	
Scoping Session Purpose: Discuss the scope of the water monitoring component of the Current Conditions Monitoring Program	

Name	Affiliation	E-mail Address
EPA Team		
Michael Sivak	USEPA	Sivak.michael@epa.gov
Diane Salkie	USEPA	salkie.diane@epa.gov
Chuck Nace	USEPA	Nace.Charles@epa.gov

QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

Name	Affiliation	E-mail Address
Beth Franklin	USACE	Elizabeth.A.Franklin@usace.army.mil
Andrew Bullard	CDM Smith	bullardak@cdmsmith.com
Jonathan Clough	Warren Pinnacle	jclough@warrenpinnacle.com
Dan Cooke	CDM Smith	cookedw@cdmsmith.com
Aaron Frantz	CDM Smith	FrantzAR@cdmsmith.com
Ed Garland	HDR	edward.garland@hdrinc.com
John Kern	Kern Statistical Services	jkern@KernStat.com
Scott Kirchner	CDM Smith	kirchnersf@cdmsmith.com
Keegan Roberts	CDM Smith	robertsk@cdmsmith.com
James Wands	HDR	james.wands@hdrinc.com
NJDEP Team		
Anne Hayton	NJDEP	Anne.hayton@dep.nj.gov
Jay Nickerson	NJDEP	jay.nickerson@dep.nj.gov
Myla Ramirez	NJDEP	Myla.Ramirez@dep.nj.gov
John Wolfe	LimnoTech	jwolfe@limno.com
CPG Team		
Robert Law	de maximis	rlaw@demaximis.com
Bill Potter	de maximis	otto@demaximis.com
Gary Fisher	CPG	gary.fisher@nokia.com
Doug Reid-Green	CPG	douglas.reid-green@basf.com
Kristen Durocher	AECOM	Kristen.Durocher@aecom.com
Sue Harden	AECOM	susan.harden@aecom.com
John Connolly	Anchor QEA	jconnolly@anchorqea.com
Jim Rhea	Anchor QEA	jrhea@anchorqea.com
Mark LaRue	Anchor QEA	mlarue@anchorqea.com

QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

Name	Affiliation	E-mail Address
Peter Israelsson	Anchor QEA	pisraelsson@anchorqea.com
Mike Johns	Windward Environmental	MikeJ@windwardenv.com
Lisa Saban	Windward Environmental	lisas@windwardenv.com

Comments/Decisions: The CPG presented a more detailed proposal for the Current Conditions Monitoring Program to EPA, NJDEP, and their consultants. EPA and NJDEP were generally in agreement on the PWCM scope. EPA recommended that the number of vertical casts for turbidity, conductivity, and temperature along the cross-channel transects be increased to seven from CPG's original proposal of three to five locations. CPG accepted this recommendation and indicated that the target for submittal of the PWCM QAPP/FSP would be in mid-May 2019.

QAPP Worksheet #10: Conceptual Site Model
(UFP-QAPP Manual Section 2.5.2)
(EPA 2106-G-05 Section 2.2.5)

Refer to the CPG's QAPP for information on the conceptual site model and data quality objectives (DQOs). The CPG will support the RI/FS by establishing current conditions in the LPR and gathering data for further calibration of the sediment transport model.

QAPP Worksheet #11: Project Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

The CPG's QAPP will address project DQOs. Split samples will be used to support goals of the oversight program. The problem and framework for oversight are as follows:

1. **State the Problem**

   The CPG is leading the PWCM investigation; EPA and USACE need to determine the accuracy of CPG-generated data and ensure work is executed in compliance with approved documents. Oversight will include field observation and acceptance of split samples to verify site characterization.

   CDM Smith will assist EPA and USACE in oversight of CPG activities by providing field oversight and analysis of split samples from the CPG's contractor to verify compliance with its approved project plants and accuracy of its data. To evaluate CPG's data accuracy, CDM Smith will accept approximately 10% split samples for analysis at locations determined by coordination with the CPG and in consultation with the USACE PM and EPA RPM.

   CDM Smith oversight of the CPG's field investigation will include the following activities:

   - Technical review and evaluation of the CPG's project plans and reports
   - Documentation of field activities observations and deviations from approved plans
   - Acceptance of split samples
   - Sample handling, packaging, and shipping to off-site laboratories
   - Review of CPG-selected sampling locations
   - Comparison of data sets to determine any analytical bias

2. **Identify Study Goals**

   The data will be used to verify, through independent oversight and split sampling analysis, that the CPG activities are in accordance with the CPG's QAPP and health and safety plan (HASP) and that the CPG's data are representative of the site conditions and contaminant concentrations. Oversight and split sample data will be used to answer the environmental questions below:

QAPP Worksheet #11: Project Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

- Is the CPG contractor complying with approved plans and approved deviations?
- Do the CPG data adequately characterize the site, and are the data representative and useful for project decisions?
- Are the CPG and CDM Smith data complete and accurate?
- Are the data sets comparable as defined on Worksheet #37?
- Do the data show any analytical bias?
- Do PRP and CDM Smith data have relative percent differences (RPDs) within specified measurement performance criteria?

3. Identify Information Inputs

The primary required data types will be analytical results of surface water collected from the LPR. Surface water samples will be analyzed for SSC, POC, and DOC during the PWCM.

CDM Smith, in consultation with the USACE PM and EPA RPM, will determine sample locations to be split. CDM Smith will accept samples during the CPG field program and send to a subcontract laboratory for analysis. The data generated will be used to assess data accuracy and compliance to the governing documents and overall project scope. The oversight data will be used to answer the study questions listed in Step 2 above.

4. Define the Boundaries of the Study

CDM Smith will only be accepting split samples during the field investigation activities at a frequency of approximately 10%. Sample locations will be determined in consultation with the USACE PM and EPA RPM. Samples selected for split sampling data will cover a range of locations and concentrations and critical items, such as areas of potential contamination. Samples will be accepted from each media type collected by the CPG.

Split samples accepted during oversight of the PWCM will be analyzed for SSC, POC, and DOC.

Sampling oversight will be performed according to the CPG's schedule.

QAPP Worksheet #11: Project Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

5. Determine the Analytical Approach

Field observations and split sample data will enable CDM Smith to perform technical review and evaluation of the CPG field program, analytical data, and reports and qualitatively assess any potential bias in the CPG data set. Sample results will be evaluated against the CPG's project quantitation limit goals (no project action limits were set for the physical parameters collected during the PWCM) on Worksheet #15 and against the CPG's data using split sample data quality indicators on Worksheets #12 and #28. Field implementation will be measured against procedures in the CPG's field plans. The project decision criteria below will apply.

6. Project Decision Conditions ("If…, then..." statements)

- If the field work is inconsistent with the CPG QAPP and field sampling plans, then field oversight staff will verify tasks with respect to the CPG's QAPP and HASP and note deviations with the CPG's field project leader and document such discussions in the Periodic Field Summary Reports sent to USACE and EPA. The CDM Smith PM, USACE PM, and EPA RPM will be informed if there are deviations from the work plan and/or CPG QAPP.
- If the CPG team needs to relocate field sample locations or if there are any changes to the planned field program, then CDM Smith will communicate this change to the USACE PM and EPA RPM and document it on the Daily Field Summary Reports.

CDM Smith will present data findings to USACE and EPA, who will determine if any additional actions are required.

7. Select Performance and Acceptance Criteria

- CDM Smith's QC data will be used to determine split samples data quality and whether sample results are acceptable based on the established project DQOs. Sample results will be compared to the measurement performance criteria of the data quality indicators.
- Laboratory analysis will be performed through the subcontract laboratory.
- Definitive level data are required for full validation of the data.

QAPP Worksheet #11: Project Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

- Project-specific quantitation limits are specified on Worksheet #15 for analyses to be conducted during PWCM. Analytical data generated will be compared against these limits. Data must meet the DQOs that have been specified for the site. Refer to Worksheets #12, #18, and #28.
- Laboratory quantitation limits are anticipated to be low enough for comparison of the split samples to the CPG's data set.
- To ensure measurement performance criteria for usability (criteria for measures of precision, accuracy, representativeness, comparability, completeness, and sensitivity) are met, all data will be subject to validation and the outputs will be used to perform a data usability assessment.

8. Detailed Plan of Obtaining Data

Field sampling and field procedures are described in the CPG's QAPP. See CPG figures in Appendix A for potential split sample locations.

CPG contractor's representatives will collect and fill the sample containers, and CDM Smith's field personnel will prepare the split samples for shipment. CDM Smith will perform sample management and prepare, package, and ship the split samples to the assigned laboratories. The subcontract laboratory will generate the data. The EPA RSCC will communicate laboratory assignments to CDM Smith.

CDM Smith field personnel will observe the implementation of field and sampling activities and note any deviations from the CPG QAPP. Deviations will be brought to the attention of the CPG's contractor and reported to the CDM Smith PM, who will communicate this information to the USACE PM and EPA RPM. These deviations will be documented in the daily communications and in the CDM Smith oversight report. The oversight report will include a discussion of the impact of the deviation(s) on the data quality. The CPG contractor's activities will be documented in the field logbook.

Data Reporting

- Field observations will be recorded using field oversight forms provided in Appendix C.
- Sampling data results will be sent by the subcontract lab via email or an online web portal for evaluation and preparation of a data comparability report.

QAPP Worksheet #11: Project Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

- Final validated data will be submitted to CDM Smith in electronic format from the subcontract laboratory.
- Following completion of laboratory analyses and receipt of all electronic and hard copy data, results will be presented in CDM Smith generated reports. Report(s) will include tabulated results and a discussion of the data quality and its comparability with the CPG's data. This review will be used to evaluate the accuracy of the CPG data.

Data Archiving

- Chain of custody information will be uploaded to the EPA sample management office (SMO) website for archiving and transmittal of information.
- Data generated by the subcontract laboratory will be e-mailed to CDM Smith and USACE within the specified 21-day turnaround time.
- Data will be verified and validated in accordance with Worksheets #34, #35, and #36.
- Verified and validated electronic analytical data will be uploaded to the Passaic River/Newark Bay EQuIS Enterprise Database.

Records and documents will be maintained for the period specified in the contract.

QAPP Worksheet #12a: Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group Wet Chemistry – Suspended Solids Concentration (SSC) by ASTM 3977
Concentration Level Low

Data Quality Indicators	QC Sample and/or Activity Used to Assess Measurement Performance	Measurement Performance Criteria
Overall Precision	Split samples	≤40 percent (%) RPD if both sample and split results ≥5QL absolute difference (ABS) ≤ quantitation limit (QL) when either result < 5xQL
	Field duplicate samples	≤40 percent (%) RPD if both sample and duplicate results ≥5QL absolute difference (ABS) ≤ quantitation limit (QL) when either result < 5xQL
Analytical Accuracy/Bias	Quality Control Sample (QCS) or Laboratory Fortified Blank	80-120 percent recovery (%R) or as stipulated by manufacturer or laboratory
Accuracy (preservation)	Temperature Blank checks DV	0 to 6 degrees Celsius (°C)
Analytical Precision	Laboratory matrix duplicate/ DV	≤20 % RPD if values >5xQL; otherwise ABS ≤ QL
Comparability	data quality assessment (DQA)	Comparable units, QLs and methods
Completeness	DQA	≥ 90%
Overall Sensitivity/ Accuracy	Method blanks	≤ QLs
Sensitivity	Data Review	Detection limits meet project goals

[1] QAPP Worksheet # 23 provides more information on the sampling and analytical standard operating procedures (SOPs).

- Subcontract laboratory criteria are TBD and may differ from the above.

QAPP Worksheet #12b: Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group Wet Chemistry - DOC by EPA 9060A
Concentration Level Low

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Overall Precision	Field duplicate and split samples	≤40% RPD if both sample and duplicate results ≥5QL ABS ≤ QL when either result < 5xQL
Analytical Accuracy	Matrix Spike	80-120%R
Analytical Accuracy/Bias	QCS; Laboratory Fortified Blank /DV	80-120%R or as updated by laboratory or stipulated by manufacturer
Analytical Precision	Laboratory replicate	RPD ≤ 20% if values >5x QL; otherwise ABS < QL
Accuracy (preservation)	Temperature Blank /DV	0 to 6°C
Comparability	DQA	Comparable units, QLs and methods
Completeness	DQA	≥ 90%
Analytical Bias/accuracy	Method blanks/Calibration Blank	≤ QLs
Sensitivity	DQA	Detection limits meet project goals

- Subcontract laboratory criteria are TBD and may differ from the above.

QAPP Worksheet #12c: Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Aqueous
Analytical Group Wet Chemistry - POC by ASTM D6316
Concentration Level Low

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Overall Precision	Field duplicate and split samples	≤40% RPD if both sample and duplicate results ≥5QL ABS ≤ QL when either result < 5xQL
Analytical Accuracy/ Bias	QCS or Laboratory Fortified Blank or Standard Reference Material	75-125%R or as stipulated by manufacturer or laboratory
Analytical Precision	Laboratory duplicate/DV	≤30 %RPD if values >5xQL; otherwise ABS ≤ QL
Analytical Accuracy	ICV/continuing calibration verification (CCV)	85-115%R
Accuracy (preservation)	Temperature Blank checks Data validation /DV	0 to 6 °C
Comparability	DQA	Comparable units, QLs and methods
Completeness	DQA	≥ 90%
Analytical Sensitivity/ Accuracy	Method blanks/Calibration Blank – evaluated in DQA	≤ QLs
		Detection limits meet project goals

[1] QAPP Worksheet # 23 provides more information on the sampling and analytical SOPs.

- Subcontract laboratory criteria are TBD and may differ from the above.

QAPP Worksheet # 13: Secondary Data Criteria and Limitations Table
(UFP-QAPP Manual Section 2.7)
(EPA 2106-G-05 Chapter 3: QAPP Elements for Evaluating Existing Data)

Data Type	Data Source	Data Use Relative to Current Project	Factors affecting the Reliability of Data and Limitations on Data Use
Water column monitoring/ physical data collection	AECOM. 2009. Quality Assurance Project Plan/Field Sampling Plan Addendum, Remedial Investigation Water Column Monitoring/Physical Data Collection for the Lower Passaic River, Newark Bay and Wet Weather Monitoring. Revision 2. December.	Parent sample data generated by the CPG was compared to split samples collected by CDM Smith. The proposed sampling builds upon this data set.	There are no limitations on use of the data.

QAPP Worksheet #14 &16: Project Tasks & Schedule
(UFP-QAPP Manual Section 2.8.2)
(EPA 2106-G-05 Section 2.2.4)

Activity	Responsible party	Description	Deliverable(s)	Deliverable due date
Draft QAPP	CDM Smith	Prepare and submit draft version of the oversight QAPP to EPA and USACE	Draft QAPP	July 2019
Final QAPP	CDM Smith	Prepare and submit final version of the oversight QAPP to EPA and USACE	Final QAPP	July 2019
QAPP Addenda	CDM Smith	Prepare and submit QAPP addendums as appropriate	QAPP Addenda	TBD
Laboratory Assignment	CDM Smith	Submit Analytical Services Request Forms	Subcontract laboratories and EPA LSASD laboratory assignments	TBD
Field Oversight	CDM Smith	Oversight of PWCM field activities	Summary report of field observations, including photos	TBD
Split Samples	CDM Smith	Collection of split samples and submission for analysis	Samples obtained per oversight QAPP shipped to assigned laboratories	Split samples will be collected during the CPG-implemented field sampling program starting July 2019
Laboratory Analysis	Subcontract Laboratory	Analysis of the collected split samples	Data package	TBD, dependent on CPG schedule; for standard analyses, 21 days after last sample is received; specialized analyses may take additional time
Data Validation	CDM Smith	Validation and verification of sample data	Validated data report	TBD
Oversight/Data Evaluation	CDM Smith	Evaluation of the CPG-collected data and comparison against CDM Smith-collected split samples	Oversight summary report/data quality summary report	TBD

* Deliverable due dates may be moved pending unexpected delays during field work.

QAPP Worksheet #15: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits (UFP-QAPP Manual Section 2.6.2.3 and Figure 15) (EPA 2106-G-05 Section 2.2.6)

Matrix: Surface water
Analytical Method: Physical water column analyses (ASTM D3977 [SSC], ASTM D6316 [POC], and EPA 9060A [DOC])
Concentration level (if applicable): Low

Analyte	Project Action Limit (PAL)[1]	PAL Reference	Project Quantitation Limit Goal (PQLG)[2]	Method Detection Limit	Quantitation Limit (QL)
Subcontract Laboratory[5]					
SSC (1.5 micrometer [µm] filter)	None	NA	4 mg/L	1.2 mg/L	4 mg/L
POC[4]	None	NA	0.2 mg/kg	0.1 mg/kg	0.2 mg/kg
DOC	None	NA	1 mg/L	0.1 mg/L	1 mg/L
LSASD[3]					
SSC (1.5 micrometer [µm] filter)	None	NA	1.0 milligrams per liter (mg/L)	NA	1.0 mg/L (with > 1L volume sample)
POC[4]	None	NA	0.01 mg/kg	0.005 mg/kg	0.01 mg/kg
DOC	None	NA	0.5 mg/L	0.25 mg/L	0.5 mg/L

[1] Project-specific action levels have not been approved by EPA for these parameters. Differences in laboratory detection limits will be considered when comparing the data.

[2] The target PQLG listed is based on laboratory achievable QL.

[3] LSASD QLs are anticipated to be low enough to allow comparison of the split sample data to the CPG data. Detection limits are based on communications with Jim Ferretti of the LSASD laboratory and are derived from a LSASD study conducted on water column samples from the New York Bight study. The method detection limit (MDL) for POC and DOC are estimates and are one half of the QL.

[4] To increase data usability between these parameters, one container will be accepted for POC and DOC. After laboratory filtration, the filter will be analyzed for POC and the supernatant will be analyzed for DOC. This method will allow for better correlation between the parameters and unit conversion of POC from milligrams per liter (mg/L) to milligrams per kilogram (mg/kg) with less uncertainty.

[5] The stated limits are based on the CPG's QAPP. The subcontract laboratory must have limits at or below the CPG's limits.

QAPP Worksheet # 17a
Sampling Design and Rationale
Oversight and Split Sampling

Describe and provide a rationale for choosing the sampling approach:
As part of the project, the CPG is implementing an investigation and field sampling program in support of an RI/FS or other investigation. On behalf of the EPA, CDM Smith will provide oversight and will accept and analyze split samples. The oversight program is designed to provide technical review and evaluation of associated CPG-implemented QAPPs. Worksheet #10 states the oversight activities to occur during the field sampling programs, and Worksheet #11 provides details on the collection of split samples. Oversight forms are provided in Appendix C; additional forms if required will be included in QAPP addenda.

Oversight will include field observation of maintenance checks of instruments and acceptance of physical data for use in characterizing LPR estuarine dynamics and the movement of suspended sediments. Additional oversight will include a review of CPG-selected sampling locations (as necessary, oversight staff will communicate with EPA and USACE on sampling locations).

CDM Smith will accept split samples at a rate of approximately 10% to ensure the CPG's data are accurate. Locations for the split samples will be selected prior to the start of each oversight activity and determined by the EPA and CDM Smith PM. Field activities will be conducted according to the Technical SOPs below:

Describe the Sampling Action and Rationale in terms of: Matrix to be sampled and Frequency (including seasonal considerations); Sampling locations (including QC, critical, and background samples); Analytical groups and Concentration; Number of samples to be taken:

Sampling and analysis rationale, matrices to be sampled, and analytical group are summarized in Worksheet #18.

Decontamination Procedures
Equipment decontamination procedures will be implemented by the CPG in accordance with its QAPP and HASP. CDM Smith will follow the Updated Accident Prevention Plan (CDM Smith 2019), including the Site Safety and Health Plan included as an appendix.

Field Procedures for these Activities are detailed in:

- Technical SOP 1-2 Sample Custody
- Technical SOP 2-1 Packaging and Shipping Environmental Samples
- Technical SOP 4-1 Field Logbook Content and Control
- Technical SOP 4-2 Photographic Documentation of Field Activities
- Data Management Plan

CDM Smith's referenced Technical SOPs are included in Appendix B.

QAPP Worksheet #18: Sampling Locations and Methods
(UFP-QAPP Manual Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.3.1 and 2.3.2)

Sample ID	*Matrix*	*Depth (feet below ground surface [bgs])*	*Type*	*Analyte/Analytical Group*	*Sampling SOP*	*Comments*
Refer to QAPP prepared by Anchor QEA for CPG	Aqueous	Refer to QAPP prepared by Anchor QEA for CPG	Grab	39 split samples for SSC, POC, DOC (total for four sampling events) and 4 duplicates (one per sampling event)	Refer to QAPP prepared by Anchor QEA for CPG	See worksheet 17a for sampling rationale

Over the course of the study, the CPG is collecting approximately 384 samples for SSC, DOC, and POC analysis during transect survey sampling. Approximately 10% split samples for SSC, DOC, and POC analysis will be accepted during transect surveys over an approximately 6-month instrumentation deployment period. Samples will be collected from five locations on the LPR (cross-channel transects at RM 13.5, 12, 10.2, and 8.4 and an along-channel transect approximately 1 mile upstream to 2 miles downstream of the salt front). The surveys will be conducted during ebb and flood tides during each field event; events will be coordinated to capture low, medium-low, medium-high, and high flow events as indicated by the Dundee Dam U.S. Geological Survey gage.

Per the CPG PWCM QAPP, samples will be collected at each location from a depth of 3 feet below river surface (top) and 2 feet above river bottom (bottom) at three predetermined locations along each cross-channel transect line and approximately 12 locations, 0.25 mile apart, on the along-channel transect. Split samples will be accepted from different transects and varied tidal conditions (during flood or ebb tides) during the four field events (low, medium-low, medium-high, and high flow). In general, split samples will be collected from top and bottom samples at a particular sample location along a transect.

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times
(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

Laboratory: Subcontract laboratory - TBD
List any required accreditations/certifications: provided upon procurement of laboratory
Sample Delivery Method: FedEx Overnight

Analyte/ Analyte Group	Matrix	Analytical and Preparation Method/ SOP[1,2]	Accreditation Expiration Date	Container(s)[5] (number, size, and type per sample)	Preservation[3]	Preparation Holding Time	Analytical Holding Time[4]	Data Package Turnaround Time
SSC	Aqueous	ASTM D3977 1.5 µm filter	Provided upon procurement of laboratory	TBD based on laboratory requirements	TBD based on laboratory requirements	NA	7 days	Turnaround time (TAT) is 21 days for analysis, 21 days for DV
POC		ASTM D6316		TBD based on laboratory requirements[6]	TBD based on laboratory requirements		60 days	
DOC		EPA 9060A					28 days	

[1] Subcontract laboratory SOPs to be provided upon procurement of laboratory.

[2] Method modifications are included on this worksheet and on Worksheet #23.

[3] POC samples will need to be filtered with pre-weighed glass fiber filter upon receipt at the laboratory. Sample custody will be in accordance with Technical SOP 1-2; Preserved samples will be shipped according to CDM Smith Technical SOP 4-1; and procedures documented in accordance with Technical SOP 4-1.

[4] Holding times are from date of collection.

[5] Bottleware and preservatives for split sample acceptance to be provided by subcontractor laboratory. Sample volume may be limited; CDM Smith will communicate with EPA RSCC or the subcontract laboratory to prioritize analysis or to combine bottleware where applicable. Actual bottelware may vary based on discussions with subcontract laboratory to achieve limits specified on Worksheet #15.

[6] To increase data usability between these parameters, one container will be accepted for POC and DOC. After laboratory filtration, the filter will be analyzed for POC and the supernatant will be analyzed for DOC. This method will allow for better correlation between the parameters and unit conversion of POC from mg/L to mg/kg with less uncertainty.

QAPP Worksheet #20: Field Quality Control Summary[1]
(UFP-QAPP Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.3.5)

Matrix	Analyte/ Analyte Group[2]	Method/SOP	Field Samples	Field Duplicate	Matrix Spike/ Matrix Spike Duplicate (matrix spike [MS]/matrix spike duplicate [MSD])	Field Equipment Blanks	Trip. Blanks	Other	Total[3]
Aqueous	SSC	ASTM D3977	39 split samples from 4 events at 5 transects (4 cross-channel, 1 along-channel)	4 (1 per event; 4 events)	4 MS 4 MSD (1 per event; 4 events)	0	0	0	43
Aqueous	DOC	EPA 9060A	39 split samples from 4 events at 5 transects (4 cross-channel, 1 along-channel)	4 (1 per event; 4 events)	4 MS 4 MSD (1 per event; 4 events)	0	0	0	43
Aqueous	POC	ASTM D6316	39 split samples from 4 events at 5 transects (4 cross-channel, 1 along-channel)	4 (1 per event; 4 events)	4 MS 4 MSD (1 per event; 4 events)	0	0	0	43

[1] Due to the dynamic nature of this task order, additional tasks will be included in QAPP addenda.

[2] POC and DOC will be accepted in the same container. Laboratory will filter sample and report suspended solids associated with the 0.7 µm filter. Worksheet #23 describes the project-specific method modifications.

[3] Laboratory QC samples (MS and duplicate) are not included in the total number of samples.

QAPP Worksheet #21: Field SOPs
(UFP-QAPP Manual Section 3.1.2)
(EPA 2106-G-05 Section 2.3.2)

Technical SOP # or reference	Title, Revision, Date, and URL (if available)	Originating Organization	SOP option or Equipment Type (if SOP provides different options)	Modified for Project? Y/N	Comments
1-2	Sample Custody, Rev. 8, February 2015	CDM Smith	NA	Y	-Sample tags are not required. -Distribution of chains of custody (COCs) as per EPA Region 2 guidelines -Use waterproof ink for any handwritten labels.
2-1	Packaging and Shipping Environmental Samples, Rev. 6, February 2015	CDM Smith	NA	Y	- If wrapping material is placed around the label, write the sample number and analysis on the outside of the wrap and place in a ziplock bag and close. -Vermiculite shall not be used. Include cooler temperature blank.
4-1	Field Logbook Content and Control, Rev. 8, February 2015	CDM Smith	NA	Y	Logbook notes should include decontamination procedures and equipment used, descriptions of photographs taken, problems encountered and notes of conversations with pertinent project team members. Details of samples acceptance including equipment used, and visual observations.
4-2	Photographic Documentation of Field Activities, Rev. 9, February 2015	CDM Smith	Digital Camera	N	

[1] Bottleware and preservatives for split sample acceptance provided by subcontractor laboratory.

[2] For each sample collected and shipped the following information will be recorded (at a minimum) in the field logbook:

- Name of field personnel
- CDM Smith assigned sample number/location
- Date sampled and date shipped
- Sample location number
- Corresponding laboratory sample number
- Media type and Analysis to be performed
- Sample volume and containers; Preservatives added to sample
- Any unusual discoloration or evidence of contamination
- Field parameter measurements and calculations
- Courier airbill number and means of delivery to the laboratory
- General observations

QAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing, and Inspection
(UFP-QAPP Manual Section 3.1.2.4)
(EPA 2106-G-05 Section 2.3.6)

Field Equipment	Activity	SOP Reference	Title or Position of Responsible Person	Frequency	Acceptance Criteria	Corrective Action
Not applicable – equipment calibration, maintenance, testing, and inspection will be performed by the CPG's contractor						

QAPP Worksheet #23: Analytical SOPs
(UFP-QAPP Manual Section 3.2.1)
(EPA 2106-G-05 Section 2.3.4)

SOP #	Title, Date, and URL (if available)	Definitive or Screening Data	Matrix/ Analytical Group	SOP Option or Equipment Type	‡Modified for Project? Y/N
ASTM D3977	*Standard Test Methods for Determining Sediment Concentration in Water Samples.* 2013. Or latest revision.	Definitive	Aqueous/SSC	Filter, Oven, balance	Y – see below
Project-specific Modification: Use 1.5 µm filter (ProWeigh, Environmental Express, Model F93447MM-X). Use entire sample bottle to filter. Rinse with deionized water to capture all the solids or until filter refusal. Filter within 7 days of collection. Subcontract laboratory will communicate with CDM Smith if the suspended solids concentration is relatively high and may clog the filter.					
EPA 9060A	*Total Organic Carbon.* 2004. Or latest revision.	Definitive	Aqueous/ DOC	Carbon analyzer/infra-red (IR)/flame ionization detector (FID)	Y – see below
Project-specific Modification: Use a 0.7 µm glass fiber filter (Whatman, 25 mm diameter, Model 1825-025). Filters will be pre-combusted and tared; after filtration, filters will be dried and re-weighed. The mass of suspended solids on the 0.7 µm filter will be reported in the data package. Dried POC filters will be stored frozen until analysis. Prior to combustion, POC filter will be exposed to hydrochloric fumes for 24 hours to remove inorganic carbon. Subcontract laboratory will communicate with CDM if the suspended solids concentration is relatively high and carbon load may saturate the detector. POC will be reported in units of mg/kg and mg/L (i.e., volume of water filtered).					
ASTM D6316	*Standard Test Method for Determination of Total, Combustible, and Carbonate Carbon in Solid Residues from Coal and Coke*. 2017. Or latest revision.	Definitive	Aqueous/ POC	Filter and Carbon Analyzer with IR or FID	Y – see below
Project-specific Modification: Use combustible 0.7 µm glass fiber filter (Whatman, 25 mm diameter, Model 1825-025). Filter within 48 hours of sample collection and preserve. Expose to HCl fumes to remove inorganic carbon. Combust entire filter to reduce errors. Reported DOC values will be the average of two analyses.					

[1] The Field and Analytical Services Teaming Advisory Committee (FASTAC) policy for procuring analytical services was implemented; Subcontract laboratory will perform analyses. Subcontract laboratory maintains the laboratory's SOP information. The SOP will be modified to facilitate comparison with the CPG data.

QAPP Worksheet #24: Analytical Instrument Calibration
(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Title/Position Responsible for Corrective Action	SOP Reference
Soil TOC Analyzer	Calibration and corrective action as per Manufacturer's instruction. No samples shall be analyzed if instrument calibration exceeds the acceptance criteria.				Laboratory analyst / QA officer - TBD	See Worksheet #23
Infra red Spectrophotometer	Initial Calibration; 5 point standards	Every 3 months or when other unresolved QC failure occurs	90-110 % R	Re-check; re-calibrate		
UltraViolet Spectrophotometer	Calibration check	Every 10 samples and at end of analytical run	80-120 % R	Re-check; re-calibrate and rerun all samples analyzed after last valid Cal Check		
Thermometer	Calibration	Quarterly; serviced annually	±1°C of true value of National Institute of Standards and Technology (NIST) traceable thermometer	Replace defective thermometer		TBD
Analytical Balance	Calibration verification	Daily - before use	See instrument manual	Troubleshoot as per equipment manual/call for repair		
	Mass check	Daily - before use	See instrument manual			
	Temperature check	Annually	± 2°C			
Oven	Serviced annually as per Manufacturer's instruction					
pH meter	Daily buffer checks (2 point bracketing sample pH)	Before use/per batch; other checks as per rental company/manufacturer's recommendations	± 0.1 pH units or ± 0.05 pH units	Recheck; replace buffer solutions and recheck. If still fails perform instrument check or place out of service		

[1] Subcontract laboratory's calibration and/or method SOPs will be used to meet calibration criteria. Specific instrument information (manufacturer and model) is not available at this time.
[2] TBD – Reference SOP depends on the laboratory assignment. EPA maintains the LSASD laboratory SOP information. If a subcontract laboratory is needed, CDM Smith will submit its SOP as a field change request.
[3] R represents the correlation coefficient.
[4] The laboratory SOP will include the calibration range information.

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection
(UFP-QAPP Manual Section 3.2.3)
(EPA 2106-G-05 Section 2.3.6)

A subcontract laboratory (TBD) will be used for analysis of split samples. Maintenance, testing, and inspection frequencies are documented in the laboratory's SOPs.

QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal
(UFP-QAPP Manual Section 3.3)
(EPA 2106-G-05 Section 2.3.3)

Sampling Organization: CDM Smith
Laboratory: Subcontract laboratory - TBD
Method of sample delivery (shipper/carrier): FedEx Overnight
Number of days from reporting until sample disposal: Subcontract laboratory - TBD

Activity	Organization and title or position of person responsible for the activity	SOP reference
Sample labeling	CDM Smith - FTL	Technical SOP 2-1
Chain-of-custody form completion	CDM Smith – Sample manager	Technical SOP 1-2
Packaging	CDM Smith – Sample manager	Technical SOP 1-2 and 2-1
Shipping coordination	CDM Smith - FTL, CDM Smith ASC/ CLP coordinator (if CLP used in QAPP addenda)	Technical SOP 2-1
Sample receipt, inspection, & log-in	Laboratory custodian (subcontract laboratory)	Analytical SOW and Laboratory SOP
Sample custody and storage	CDM Smith and Laboratories (subcontract laboratory)	Technical SOP 1-2; Analytical SOW or Laboratory Technical SOP
Sample disposal	Laboratory Custodian (subcontract laboratory)	Laboratory Technical SOP

[1] Duplicates will be indicated by adding 100 to the location number. For example, MW1-100- 011012 would indicate a duplicate sample collected from MW-1 on January 10, 2012.

QAPP Worksheet #28a: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous
Analytical Group Wet Chemistry-SSC
Analytical Method/SOP Reference ASTM D3977 Modified by subcontract laboratory

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Preparation/ Method Blank	1 per batch of 20 samples	None	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise reanalyze and qualify data	subcontract laboratory	No analyte > QL
Laboratory Duplicate	1/20 or per batch	Per laboratory SOP, ≤ 20 RPD	Flag outliers	subcontract laboratory	≤ 20 RPD; ABS ≤QL for samples <5x QL
Split Samples	See Worksheet #17 for split samples	None	Data assessor to inform PM if MPC is exceeded; flag results in report	CDM Smith ASC	≤40% RPD if > 5xQL otherwise ABS ≤QL
Field Duplicates	1 duplicate per 20 samples or per event	None	Data assessor to inform PM if MPC is exceeded; flag results in report	CDM Smith ASC	≤40% RPD if > 5xQL otherwise ABS ≤QL
Laboratory control sample (LCS) or Quality Control Sample	2 per batch of 20 samples	Average Recovery within the standard manufacture's limits or method limits; % RPD < 20	Identify source of problem, re-prepare and re-analyze or flag outliers	subcontract laboratory	80-120%R or as stipulated stipulated by manufacturer or laboratory
LCS or Quality Control Sample Duplicate				subcontract laboratory	≤20% RPD
Temperature Blank	1 per cooler	0 to 6 degrees C	Note outlier in laboratory narrative. Inform CDM Smith of failure and need for additional coolant; check packing procedure	subcontract laboratory	≤ 6 degrees C

- Subcontract laboratory criteria are TBD and may differ from the above.

QAPP Worksheet #28b: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous
Analytical Group Wet Chemistry-DOC
Analytical Method/SOP Reference EPA 9060A Modified by subcontract laboratory

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Method Blank /Calibration Blank	1 per 20 samples	< QL	If samples non-detect or if lowest sample result is >10 times the blank- no action; otherwise redigest /reanalyze. Flag results or modify reporting limit.	subcontract laboratory	No analyte > QL
ICV/CCV	1 per batch of 10 samples	85-115%R	Suspend analysis, find cause, and reanalyze associated samples	subcontract laboratory	85-115%R
Laboratory Duplicate	All samples duplicated	≤ 20% RPD if values >5QL; otherwise ABS≤5QL	Flag outliers	subcontract laboratory	RPD ≤ 20% if values >5QL; otherwise ABS≤5QL
Matrix Spike	1 per batch of 20 samples	80-120%R	Flag outliers	subcontract laboratory	80-120%R
LCS/ Quality Control Sample	1 per batch of 20 samples	80-120%R	Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze or flag outliers	subcontract laboratory	80-120%R or as stipulated stipulated by manufacturer or laboratory
LCS or Quality Control Sample Duplicate		RPD ≤ 20%			RPD ≤ 20%
Split Samples	See Worksheet #17 for split samples	None	Data assessor to inform PM if MPC is exceeded; flag results in report	CDM Smith ASC	≤ 40% RPD if results >5xQL; otherwise ABS ≤QL
Field Duplicates	1 duplicate per 20 samples or per event	None	Data assessor to inform PM if MPC is exceeded; flag results in report	CDM Smith ASC	≤ 40% RPD if results >5xQL; otherwise ABS ≤QL
Temperature Blank	1 per cooler	0 to 6 degrees C	Note outlier in laboratory narrative. Inform CDM Smith of failure /need for additional coolant; check packing steps	subcontract laboratory	≤ 6 degrees C

- Subcontract laboratory criteria are TBD and may differ from the above.

QAPP Worksheet #28c: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix Aqueous
Analytical Group Wet Chemistry-POC
Analytical Method/SOP Reference ASTM D6316 Modified by subcontract laboratory

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Method Blank /Calibration Blank	1 per batch of 20 samples or less	< QL	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise redigest and reanalyze. Flag results or modify reporting limit.	subcontract laboratory	No analyte > QL
Laboratory Duplicate	All samples duplicated	Per subcontract laboratory SOP	Flag outliers	subcontract laboratory	RPD ≤ 20 if values >5xQL otherwise ABS ≤QL
ICV/CCV	ICV-prior to samples; CCV 1 per batch of 10 samples or every 12 hours	85-115%R	Suspend analysis, find cause, and reanalyze associated samples	subcontract laboratory	90-110%R
LCS/Analytical Quality Control	1 per batch of 20 samples or less	80-120%R or as supplier certified	Identify source of problem, re-prepare and re-analyze or flag outliers	subcontract laboratory	80-120%R or as supplier certified
LCS/Analytical Quality Control Duplicate		RPD ≤ 20%			RPD ≤ 20%
Sample splits	See Worksheet #17 for split samples	None	Data assessor to inform PM if MPC is exceeded; flag results in report	CDM Smith ASC	RPD ≤ 40% if results >5xQL otherwise ABS ≤QL
Field Duplicate	1 duplicate per 20 samples or per event	None	Data assessor to inform PM if MPC is exceeded; flag results in report	CDM Smith ASC	RPD ≤ 40% if results >5xQL otherwise ABS ≤QL
Temperature Blank	1 per cooler	0 to 6 degrees C	Note outlier in laboratory narrative. Inform CDM Smith of failure and need for additional coolant; check packing procedure	subcontract laboratory	≤ 6 degrees C

- Subcontract laboratory criteria are TBD and may differ from the above.

QAPP Worksheet #28d: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

PROCEDURE FOR QC SAMPLE COLLECTION

Duplicates: Field duplicate samples are collected and analyzed to assess the overall precision of the field sampling technique. Duplicate samples, of the same matrix, will be collected at a rate of 5% (1 per 20 samples) or 1 per every 14 days or 1 if less than 20 samples are collected. These duplicates will be submitted "blind" to the laboratories by using sample numbers that differ from their associated environmental samples. For groundwater samples collected during the sampling event, duplicate samples will be collected on a per event basis.

Duplicate samples will be collected by alternately filling bottles for the same analysis.

Cooler Temperature Indicators

One cooler temperature indicator or "temperature blank" will be placed in each cooler containing samples (solid and aqueous) being sent to the laboratory for analysis. The temperature blank will consist of a sample container filled with nonpreserved water (potable or distilled). The container will be labeled "COOLER TEMPERATURE INDICATOR" and dated.

Matrix Spikes

MS are laboratory QC samples drawn from excess volumes of existing samples to demonstrate the accuracy of laboratory analysis. In accordance with EPA Region 2, MS will be designated on environmental samples at a rate of one per sample delivery group (SDG). This designation will be noted on the sample container labels and the sample paperwork. An SDG is defined as one of the following:

1. All samples of an analytical case if the sample number is less than 20 (including environmental duplicates and QC blanks) and if sampling is completed within 7 calendar days.
2. Each group of 20 samples within an analytical case (including environmental duplicates but excluding QC blanks) if the number is greater than 20.
3. Each 7-day calendar day period during which samples within an analytical case are received. This period begins with the receipt of the first sample in the SDG.

QAPP Worksheet #29: Project Documents and Records[1]
(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

Sample Collection and Field Records			
Record	**Generation**	**Verification**	**Storage location/archival**
Field logbook or data collection sheets	Field Sampler or FTL or Designee	RI TM	Project File
Scribe Chain-of-Custody Forms	Sample Manager or Designee	FTL or Designee	Project File
Air Bills	Sample Manager or Designee	FTL or Designee	Project File
Sample Tracking Forms	Sample Manager or Designee	FTL or Designee	Project File
Daily QC Reports	FTL or Designee	RI TM or Designee	Project File
Deviations – FCR Forms	FTL or Designee	RI TM or Designee	Project File
Corrective Action Reports	PM	PM or Designee	Project File
Correspondence	PM	PM or Designee	Project File
Analytical Services Tracking System (ANSETS)	PM	ASC	Project File
Photographs	FTL or Designee	Field Scientist or Designee	Project File

QAPP Worksheet #29: Project Documents and Records[1]
(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

Project Assessments			
Record	**Generation**	**Verification**	**Storage location/archival**
Self-Assessment Checklist	PM or Designee	QA Specialist	Project File
Data verification checklists	FTL or Designee	ASC	Project File
Data validation report	Data validator	Chemist	Project File
Data usability assessment report	ASC or Designee	Chemist	Project File
Laboratory Records			
Record	**Generation**	**Verification**	**Storage location/archival**
Bid Sheets, scopes of work	TM or Designee	Technical Reviewer and Procurement Specialist	Procurement File
Subcontract Laboratory certifications	Laboratory QA Officer	Chemist or QA Specialist	Procurement File
Subcontract Laboratory QA Plans	Laboratory QA Officer	Chemist or QA Specialist	Procurement File
SOPs	Laboratory QA Officer	Chemist or QA Specialist	Procurement File

QAPP Worksheet #29: Project Documents and Records[1]
(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

Laboratory Data Deliverables				
Record[1]	**Organics**	**Metals**	**Wet Chemistry**	**Other**
Narrative	X	X	X	X
COC	X	X	X	X
Summary Results	X	X	X	X
Analytical sample results	X	X	X	X
QC Results	X	X	X	X
Chromatograms	X	NA	NA	NA[2]
Sample Preparation Log	X	X	X	X
Sample Run Log	X	X	X	X
Raw Data	X	X	X	X

[1] The records indicated are as-applicable to the oversight effort.
[2] Chromatograms are not applicable for analysis of SSC, POC, and DOC.

QAPP Worksheet #31, 32 & 33: Assessments and Corrective Action
(UFP-QAPP Manual Sections 4.1.1 and 4.1.2)
(EPA 2106-G-05 Section 2.4 and 2.5.5)

Assessment Type	Number/ Frequency	Organization	Responsible Party	Assessment Deliverable and Due Dates	Party to Identify and Implement Corrective Actions	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions
					Title and Organizational Affiliation	
Project Readiness Review	Prior to field work	CDM Smith	FTL	Immediately; to within 24 hours of review	RITM or PM, CDM Smith	PM, CDM Smith
Sample Collection and Documentation	Once	CDM Smith	FTL	E-mail within 24 hours	RITM or PM, CDM Smith	Jeniffer Oxford (QAS) or field auditor, CDM Smith
QAPP	Annually	CDM Smith	Approved CDM Smith QA Staff or QA Coordinator	E-mail, if required.	RITM, CDM Smith	PM, CDM Smith
Data Review	Once	CDM Smith	ASC or designee,	Memorandum based on project requirements	Project Chemist, FTL, or PM depending on nature of issue	PM, CDM Smith

[1] The CDM Smith QAM will determine the need for any field or office audits. If self-assessments are requested in lieu of a project audit, the QAM will review/approve/reject the request. The frequency and need for quality assessments are outlined in the Remedial Action Contract (RAC 2) Region 2 Quality Management Plan (QMP) (CDM Smith 2018).
[2] Field auditors are selected based on level of experience and technical specialty. Office audits are performed by trained and approved QA staff members. Oversight projects typically have a series of self-assessments at the discretion of the QAM.
[3] Findings and deviations from plans will require corrective actions that will be documented and discussed appropriately. The EPA RPM will be notified by the PM.
[4] No formal audits will be performed on oversight assignments.

QAPP Worksheet #34: Data Verification and Validation Inputs
(UFP-QAPP Manual Section 5.2.1 and Table 9)
(EPA 2106-G-05 Section 2.5.1)

Item	Input	Description	Verification (completeness)	Validation (conformance to specifications)
Planning Documents/Records				
1	QAPP	All planning documents will be available to reviewers to allow reconciliation with planned activities and objectives.	**X**	**X**
2	Field SOPs		**X**	**X**
3	Laboratory SOPs		**X**	**X**
Field Records				
4	Field logbooks	Field notes will be prepared daily by the Field Team and will be complete, appropriate to the project tasks, and legible. The FTL will review logbooks and records for accuracy and completeness. Upon completion of field work, logbooks and records will be placed in the project files. Field reports will be verified to ensure correct reporting of information. Review will be conducted prior to completion of each report.	X	X
5	Equipment calibration records		X	X
6	COC	Sample manager, FTL or designee will review the COC forms against the samples packed in each cooler prior to shipment. COCs will be sent with the samples to the laboratory and copies retained for the Trip Report and project files. The data validator will be review upon completion of analytical activities and verified against the laboratory report.	X	X
7	Correspondence	Relevant correspondence will be used to reconcile field records and data.	X	X
8	Field Change Request	ASC and data evaluator will review during completion of each data usability assessment/measurement report.	X	X
Analytical Data Package				
9	Laboratory analytical data packages	Laboratory analyst and QA officer will review/verify internally the completeness and technical accuracy of data prior to submittal. All laboratory data will be verified by the laboratory performing the analysis prior to submittal. EPA DV contractor-data validator or CDM Smith data validator will review data packages for content and sample information upon receipt. Data packages will be evaluated for completeness and compliance. Table 9 of the IDQTF UFP-QAPP shows items for compliance review.	X	X

QAPP Worksheet #34: Data Verification and Validation Inputs
(UFP-QAPP Manual Section 5.2.1 and Table 9)
(EPA 2106-G-05 Section 2.5.1)

Item	Input	Description	Verification (completeness)	Validation (conformance to specifications)
10	Communication Records	Relevant correspondence will be used to reconcile analytical data.	X	X
11	Field EDDs	Data Manager will determine whether required EQuIS compatible EDD fields and format were provided.	X	X
12	Outputs of the EQuIS database	Project task leader and team will compile the project data results in a sample project report. Data tables, figures and reported entries will be reviewed/ verified against hardcopy information or EQuIS output.	X	X
13	Data validation and audit reports, QAPP, and FCRs	Data assessor will prepare the project data quality and usability assessment report. The data will be evaluated against project DQOs and measurement performance criteria, such as completeness. Evaluate whether field sampling procedures were followed with respect to equipment and proper sampling support.	X	X

QAPP Worksheet #35: Data Verification Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Requirement Documents	Records Reviewed	Process Description	Responsible Person /Organization
QAPP, Technical SOP 4-1	Field logbook	Verify that records are present and complete for each day of field activities. Verify that all planned samples including field QC samples were collected and that sample collection locations are documented. Verify that meteorological data were provided for each day of field activities. Verify that changes/exceptions are documented and were reported in accordance with requirements. Verify that any required field monitoring was performed and results are documented.	Daily - FTL and At conclusion of field activities - Project QC staff
SOPs	Field logbook and FCRs	Ensure that the sampling methods/procedures outlined in QAPP were followed, and that any deviations were noted/approved. Determine potential impacts from noted/approved deviations, in regard to PQOs.	CDM Smith TM or ASC
QAPP, Technical SOP 1-2	Chain-of-custody forms	Verify the completeness of chain-of-custody records. Examine entries for consistency with the field logbook. Check that appropriate methods and sample preservation have been recorded. Verify that the required volume of sample has been collected and that sufficient sample volume is available for QC samples (e.g., MS/MSD). Verify that all required signatures and dates are present. Check for transcription errors.	Daily - FTL At conclusion of field activities - Project Chemist or Data Assessor
QAPP, Technical SOP 1-2	COC	Examine traceability of data from sample collection to generation of project reported data. Provides sampling dates and time; verification of sample ID; and QC sample information.	At conclusion of field activities - Project QC staff (data coordinator, data validator)
QAPP	Laboratory data package	Examine packages against QAPP and laboratory contract requirements, and against COC forms (e.g., holding times, sample handling, analytical methods, sample ID, data qualifiers, QC samples, etc.). Determine potential impacts from noted/approved deviations, in regard to PQOs.	Environmental Services Assistance Team (ESAT) Data Validation Personnel, EPA Region 2 or CDM Smith Data validator

QAPP Worksheet #35: Data Verification Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Requirement Documents	Records Reviewed	Process Description	Responsible Person /Organization
QAPP	Laboratory Deliverable	Verify that the laboratory deliverable contains all records specified in the subcontract SOW. Check sample receipt records to ensure sample condition upon receipt was noted, and any missing/broken sample containers were noted and reported according to plan. Compare the data package with the COCs to verify that results were provided for all collected samples. Review the narrative to ensure all QC exceptions are described. Check for evidence that any required notifications were provided to project personnel as specified in the QAPP. Verify that necessary signatures and dates are present.	Before release – Laboratory QAM Upon receipt - Project Chemist or Data Validator [ESAT or CDM Smith Data Validation Personnel or ASC]
	Field duplicates	Compare results of field duplicate (or replicate) analyses with RPD criteria.	CDM Smith ASC, Data Validator or Data Assessor
	Methods	Verify that records support implementation of the SOP - sampling and analysis.	
	Data Narrative	Determine deviations from methods and contract and the impact.	
	Audit Report	Confirm reports are used to validate compliance of field sampling, handling and analysis activities with the QAPP.	
	Field and Laboratory data and QC report	A summary of all QC samples and results will be verified for measurement performance criteria, completeness, and 10 percent verified to field and laboratory data reports from vendors. A report describing adherence to established criteria shall be prepared within 30 days of data receipt.	

QAPP Worksheet #36: Data Validation Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Analytical Group/ Method	Data deliverable requirements	Analytical specifications	Measurement performance criteria	Percent of data packages to be validated [1]	Percent raw data review/% results to recalculate	Validation Procedure[2]	Validation code	Electronic validation program/ version	Data Validator
FASTAC Tier 1 [LSASD] and Tier 4 (CDM Smith Subcontract Laboratory]									
DOC, POC, and SSC	EQuIS Region 2 compliant EDD	WS 28	WS 12 & 28	100% or as project determined	10%/10%	Data Management Plan, Stage 2B validation	S2bVM	NA	CDM Smith

[1] QAPP addenda will indicate if any streamlining of the DV procedures are required.
[2] Method requirements will be used to evaluate the data during DV.

QAPP Worksheet #36: Data Validation Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Validation Code and Label Identifier Table

Validation Code*	Validation Label	Description/Reference	
S1VE	Stage 1 Validation Electronic	Stage 1 Validation - Verification and validation based only on completeness and compliance of sample receipt condition checks.	EPA 540-R-08-005
S1VM	Stage 1 Validation Manual		
S1VEM	Stage 1 Validation Electronic and Manual		
S2aVE	Stage 2a Validation Electronic	Stage 2A Validation - Verification and validation based on completeness and compliance checks of sample receipt conditions and ONLY sample-related QC results.	
S2aVM	Stage 2a Validation Manual		
S2aVEM	Stage 2a Validation Electronic and Manual		
S2bVE	Stage 2b Validation Electronic	Stage 2B Validation - Verification and validation based on completeness and compliance checks of sample receipt conditions and BOTH sample-related and instrument-related QC results.	
S2bVM	Stage 2b Validation Manual		
S2bVEM	Stage 2b Validation Electronic and Manual		
S3VE	Stage 3 Validation Electronic	Stage 3 Validation - Verification and validation based on completeness and compliance checks of sample receipt conditions, both sample-related and instrument-related QC results, AND recalculation checks.	
S3VM	Stage 3 Validation Manual		
S3VEM	Stage 3 Validation Electronic and Manual		
S4VE	Stage 4 Validation Electronic	Stage 4 Validation - Verification and validation based on completeness and compliance checks of sample receipt conditions, both sample-related and instrument-related QC results, recalculation checks, AND the review of actual instrument outputs.	
S4VM	Stage 4 Validation Manual		
S4VEM	Stage 4 Validation Electronic and Manual		
NV	Not Validated		

The following data qualifiers will be applied during DV by a third party. Potential impacts on project DQOs will be discussed in the DV report.

- NM – Measurement Performance Criteria contained in WS 12 were not met.
- J – The result is an estimated value. The nature of the bias will be discussed in the DV report.
- E – Erroneous result (e.g., improper calculation, peak integration, etc.)

QAPP Worksheet #37: Data Usability Assessment
(UFP-QAPP Manual Section 5.2.3 including Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

The data usability assessment process will be summarized to include statistics, equations, and computer algorithms used to analyze the data:

Step 1	**Review the project's objectives and sampling design** Review the key outputs defined during systematic planning (i.e., PQOs or DQOs and MPCs) to make sure they are still applicable. Review the sampling design for consistency with stated objectives. This provides the context for interpreting the data in subsequent steps.
Step 2	**Review the data verification and DV outputs** Review available QA reports, including the data verification and DV reports. Perform basic calculations and summarize the data (using graphs, maps, tables, etc.). Look for patterns, trends, and anomalies (i.e., unexpected results). Review deviations from planned activities (e.g., number and locations of samples, holding time exceedances, damaged samples, non-compliant PT sample results, and SOP deviations) and determine their impacts on the data usability. Evaluate implications of unacceptable QC sample results.
Step 3	**Verify the assumptions of the selected statistical method** Verify whether underlying assumptions for selected statistical methods (if documented in the QAPP) are valid. Common assumptions include the distributional form of the data, data independence, dispersion characteristics, homogeneity, etc. Depending on the robustness of the statistical method, minor deviations from assumptions are usually not critical to statistical analysis and data interpretation. If serious deviations from assumptions are discovered, then another statistical method may need to be selected.
Step 4	**Implement the statistical method** Implement the specified statistical procedures for analyzing the data and review underlying assumptions. For decision projects that involve hypothesis testing (e.g., "concentrations of lead in groundwater are below the action level") consider the consequences for selecting the incorrect alternative; for estimation projects (e.g., establishing a boundary for surface soil contamination), consider the tolerance for uncertainty in measurements.
Step 5	**Document data usability and draw conclusions** Determine if the data can be used as intended, considering implications of deviations and corrective actions. Discuss DQIs. Assess the performance of the sampling design and identify limitations on data use. Update the conceptual site model (CSM) and document conclusions. Prepare the data usability summary report in the form of text and/or a table.

QAPP Worksheet #37: Data Usability Assessment
(UFP-QAPP Manual Section 5.2.3 including Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

Personnel (organization and position/title) responsible for participating in the data usability assessment: CDM Smith TM, CDM Smith Data Coordinator.

The usability assessment will be documented as follows:
The oversight report will be prepared by CDM Smith personnel, including the TM and DC. The TM will be responsible for the TM's content and for assigning work to the CDM Smith personnel who will be supporting the assessment, data comparability review, and usability assessment that will be conducted on validated data. The effectiveness of control actions will be evaluated during the laboratory review of the data and the data validation, evaluation, and quality assessment process. Data information will be documented in the laboratory narrative, data usability assessment report, and oversight report. The report will include an overall assessment of the CPG's analytical data using the results of the split sampling and field oversight, including the field oversight observations of deficiencies and compliance, and an assessment of the split sampling data quality. The following items will be assessed for CDM Smith split samples and conclusions drawn based on their results:

Precision – Split samples will be compared by matrix using the RPD for each pair of results reported above quantitation limits and presented graphically as bivariate scatter plots relative to a 1:1 line and on a table. As appropriate, alternative data comparisons will be used. For each mooring location, a mean and variance of the suspended solids (1.5 µm filter) sample. POC (0.7 µm filter) and suspended solids (0.7 µm filter) split sample data will be combined to estimate the carbon load on suspended solids greater than 0.7 µm. This carbon load will be compared to the available CPG data. If needed, other statistical determination may be conducted. Additional information on data handling is included on Worksheet #11.

Results of laboratory duplicates will be assessed during data validation, and data will be qualified according to the data validation procedures cited on Worksheet #36. RPD acceptance criteria less than or equal to those in this QAPP will be used to assess sampling precision. Absolute difference will be used when one or both results are at or below the QL. An absolute difference of less than five times the QL will be the acceptance criteria. A discussion summarizing the results of laboratory precision and any limitations on the use of the data will be described in the report.

Accuracy/Bias Contamination – Results for all laboratory blanks will be assessed as part of the data validation. During the validation process, the validator will qualify the data following the procedures described in Worksheet #36. A discussion summarizing the results of laboratory accuracy and bias based on contamination will be presented and any limitations on the use of the data will be described in the report.

QAPP Worksheet #37: Data Usability Assessment
(UFP-QAPP Manual Section 5.2.3 including Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

Overall Accuracy/Bias – The results of instrument calibration and matrix spike recoveries will be reviewed and data will be qualified according to the DV procedures cited on Worksheet #36. A discussion summarizing the results of laboratory accuracy and any limitations on the use of the data will be described.

Sensitivity – Data results will be compared to criteria provided on Worksheet #15. A discussion summarizing any conclusions about sensitivity of the analyses will be presented, and any limitations on the use of the data will be described in the report.

Representativeness – A review of adherence to the sampling plan, field procedures, and project QA audits will be performed in order to assess the representativeness of the sampling program. Data validation narratives also will be reviewed, and any conclusions about the representativeness of the data set will be discussed.

Comparability – The results of this study will be used in conjunction with the CPG's data to support the investigation results. The data will be collected, analyzed, and reported in a manner that is comparable to the CPG's data set. The RPD between CDM Smith's and the CPG's data will be calculated.

Completeness – A completeness check will be done on the analytical data generated by the laboratories. Completeness will be calculated for each analyte and compared to the project completeness goal of 90%. For sampling, completeness will be calculated as the number of samples collected and analyzed divided by the number of samples planned for collection. For each analyte, completeness will also be calculated as the number of data points that meet measurement performance criteria divided by the total number of data points for that analyte. A discussion summarizing the results of project completeness and any limitations on the use of the data will be described in the report.

Reconciliation – The DQIs presented in Worksheet #12 will be examined to determine if the MPCs were met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of major impacts observed from DV, DQIs, and measurement performance criteria assessments. Based on the results of these assessments, the quality of the data will be determined. As a result of the quality determined, the usability of the data for each analysis will be established. After the combined usability of the data from all analyses for an objective is determined, it will be concluded if the DQIs were met and whether project goals were achieved. As part of the reconciliation of each objective, conclusions will be drawn and any limitations on the usability of any of the data will be described.

Data validation reports will be reviewed to determine the quality of the data and potential impacts on data usability. Field duplicates will be evaluated against the MPCs outlined in worksheet #12. Non-compliant data will be discussed in the usability report. The following equations will be used:

QAPP Worksheet #37: Data Usability Assessment
(UFP-QAPP Manual Section 5.2.3 including Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

1. To calculate field duplicate precision:
   RPD = 100 × 2 |X1 − X2 | / (X1 + X2), where X1 and X2 are the reported concentrations for each duplicate or replicate

2. To calculate completeness:
   % Completeness = V/n × 100, where V= number of measurements judged valid; n = total number of measurements made and
   % Completeness = C/X × 100, where C= number of samples collected; X = total number of measurements planned

The results will be evaluated using temporal and spatial relationships of the data. This activity will be performed during the data usability evaluation and RI reporting. Not all "J" qualified data are usable, so all lines of evidence to support data use will be evaluated. Although "J" data are reasonable for use, CDM Smith will document the evaluation of all qualified results against the values, data quality, and bias of surrounding data. If needed, qualified results at plume edges will be mapped and evaluated. Validated results will be further examined during data evaluation and re-coded in accordance with EPA Region 2 directives.

For qualified results that are outliers or at the edge of contaminated areas:

a) Discuss how data outliers will be addressed
b) Evaluate against all issues such as geology, hydrogeology, depth, past history
c) Consider whether qualified data are reasonable based on surrounding data (e.g., data qualified due to missed holding time may be lower than we expect)
d) Address data quality bias and reason for qualification
e) Evaluate effect of data qualification on the data

The investigation results will be presented in tables and figures and in the text of the oversight report. Data gaps will be evaluated if requested by USACE or EPA. The report will discuss the completeness of the planned and collected data and the effect on the data objective of evaluating the accuracy of the CPG's data.